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Smart Voting System using Face Recongnition

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Abstract: *In todays digital age facial recognition has emerged as an incredibly powerful tool for identifying individuals via their unique facial characteristics. Building on this idea we are examining ways to integrate these technologies into the realm of secure voting methodology using advanced algorithms including Haarcascade and RBF algorithm. Our proposed system includes three layers of identity validation: UID confirmation, validating voter card numbers and using cutting edge techniques to analyze specific elements in voters' faces during authentication processes*

Keywords: UID, RBF, EVM

I. INTRODUCTION

The Indian government recognizes that free and fair built. Unfortunately traditional methods of conducting polls using electronic voting machines (EVMs) lack transparency depite being time consuming. These shortcomings result in compromised election outcomes undermining citizens' confidence in their elected representatives negatively impacting socioeconomic development efforts across Indias diverse demography. Through targeted investment aimed at enhancing electoral security measures - particularly those related to voter authentication -India can create an effective mechanism for safeguarding its democratic institutions now more than ever with rising populations relying on virtual communication platforms like e services. With the adoption of advanced technology our voting process can experience a significant boost resulting in more efficient and reliable elections. following industrialization there has been a steady increase of rural urban migration in pursuit of job opportunities. The challenge that arises relates to individuals retaining their previous residency on official documents such as voter IDs which presents significant difficulties when it comes to casting votes - resulting in reduced overall voter turnout rates across the country. The government is actively addressing this issue by seeking viable solutions.

II. PROBLEM STATEMENT

The current voting system faces several challenges such as high costs, safety risks and maintenance issues. While numerous face recognition models have been developed to detect registered voters- these require extensive datasets that consume both time and memory resources resulting in inefficiencies during elections .

Hence an algorithm with low dataset requirements yet efficient facial recognition capabilities is vital for a successful voting process.

III. OBJECTIVE

Our proposed solution incorporates three verification levels starting with UID authentication for secure electoral processes during voting. Our rigorous verification process includes a confirmation of the voter card number as step two. Advancing further, we implement cutting-edge facial recognition algorithms at level three for utmost accuracy and reliability

In[1]Matching image features across different viewpoints can be challenging when theres no prior knowledge about camera positions or orientations. In our paper we present a new approach that addresses this issue by using affine texture invariants to detect and match physical points on an object seen from multiple angles. Our method is designed to handle potential window effects by making sure our feature characterization remains invariant even under linear transformations like rotation or skew. We prioritize accuracy over quantity during structure from motion applications by ignoring unreliable matches.

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In[2] The challenge of recognizing faces is still prevalent today due to various obstacles encountered along the way like varied lightings, poses or expression configurations to mention but a few examples among many others which are responsible for causing non linear effects making it difficult to achieve high levels of performance under this area. In this paper we propose the use of robust four layer Convolutional Neural Network (CNN) architecture which offers solutions capable enough at handling challenges typically found when faced with the task of recognizing images characterized by occlusions or variable illuminations. Our results show that this CNN solution outperforms its predecessors with an impressive accuracy rate of 99.5% on the AR database while achieving a rate of 85.13% on FERET database composed of 35 subjects. In addition our system takes less than 0.01 seconds to complete the facial recognition process.

In[3] For developers working with mobile platforms finding a reliable face detection algorithm can be difficult due to limited computational and memory resources. This paper offers a promising solution by combining two existing real time implementations into a single hybrid approach. By incorporating online light source calibration and robustness against various facial positions our system delivers both speed and accuracy in even the most challenging conditions.

In[4]Our research aims to improve face recognition through an algorithm that can account for changes in lighting direction and facial expression. By adopting a pattern classification approach, we view every pixel in an image as coordinates in a high-dimensional space. We found that images of the same individual's face showcase particular patterns when compared with varying illumination levels but fixed position; these lie within an ideal 3D linear subspace within image space - given there is no shadowing present. However, real-life conditions do include self-shadowing and other deviations occur from this ideal scenario.Instead of trying to explicitly model such deviations, our solution involves projecting the image into subspaces by considering those regions of the face experiencing less deviation more significantly - using Fisher's Linear Discriminant method . Our projection method is designed to still separate classes under significant shifts in lighting or facial expressions despite these deviations.We point out that Eigen faces also use projection techniques to reduce dimensional space similarly. Empirical research has consistently shown that the "Fisher face" algorithm yields more accurate results than its counterpart, known as Eigen faces. In fact tests conducted on both Harvard and Yale Face Databases reveal that this method boasts significantly lower error rates.

In[5] Our study investigates the use of Speeded-Up Robust Features (SURF) feature extraction alongside Support Vector Machine (SVM) classification for accurate traffic sign recognition in two languages – Indonesian and English. We determined that identifying an optimal number of key points via SURF plays a crucial role in achieving high accuracy rates, with our system achieving successful detection at an impressive rate of 96% using specific lighting conditions and green box alignment on smartphone screens

IV. METHODOLOGY

Module Features:

1) Voter & Login Registry
2) Candidate Registry System
3) Facial Recognition & Data Review Methodology
4) Vote Collection Structure
5) Results Compilation

Algorithms Implemented:

1) Haar Cascade Algorithm along with RBF Algorithm

Haar cascade algorithm is an exceptional time efficient method that can promptly identify different sized items in frames using basic training processes suited for diverse categories like automobiles or fruits etcetera while operating in real time environments.

In contrast an RBF algorithm functions by forming itself around either pre determined points (centers inputted previously from initial data gathering mechanisms) or simply its origin based on precise numerical data metrics. To achieve our aim here we must incorporate the concept of an absolute value within our calculations. An absolute value is essentially how far away from zero numerical quantities are independent of their signs (positive or negative). Consider

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for instance -4; its absolute value is 4. Therefore in computing using radial basis functions principles such values are established in this manner:

V. PROPOSED SYSTEM

We propose a voting system that promises greater security through three levels of verification. Starting with a unique ID generated at registration each voter's identity will be cross checked by an Election Commission Officer before being subject to facial recognition technology for increased accuracy. For this purpose we have evaluated a facial recognition algorithm and found it to perform effectively in reducing the likelihood of false voting scenarios. Through this system we can identify fraudulent voters and eliminate their impact on election outcomes. In todays rapidly-evolving technological landscape it is imperative that we adapt our elections infrastructure accordingly - something that our proposed smart voting system aims to do just that. Voters can now avoid travel inconveniences during elections by logging into the secure online platform wherever they are located with their device having internet connection. Furthermore because results will be continuously updated every minute throughout polling day using a sophisticated algorithm integrated into our interface software; it will save significant time by producing preliminary as well as final outcomes faster than usual ways which require aggregation work after counting manually by human operators . Our sophisticated approach has been designed specifically to minimize personnel requirements while also maximizing accuracy and efficiency across all stages of the electoral process.

VI. CONCLUSION

Face recognition technology has been established as an effective means of secure authentication; applying this technology to voting systems can improve their overall integrity reducing instances of fraudulent activity. Our study employed RBF as an algorithmic solution and compared its classification performance for facial identification amidst a dataset comprising 9264 augmented images - consisting initially out of 2316 labeled ones- . The accuracy outcomes were tied directly to quality training data.

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